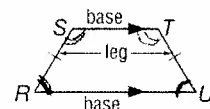


6-6 Study Guide and Intervention**Trapezoids and Kites**

Properties of Trapezoids A trapezoid is a quadrilateral with exactly one pair of parallel sides. The **midsegment** or **median** of a trapezoid is the segment that connects the midpoints of the legs of the trapezoid. Its measure is equal to one-half the sum of the lengths of the bases. If the legs are congruent, the trapezoid is an **isosceles trapezoid**. In an isosceles trapezoid both pairs of **base angles** are congruent and the diagonals are congruent.

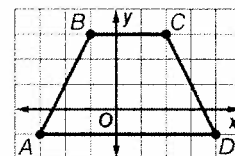


STUR is an isosceles trapezoid.

$\overline{SR} \cong \overline{TU}$; $\angle R \cong \angle U$, $\angle S \cong \angle T$

Example

The vertices of ABCD are A(-3, -1), B(-1, 3), C(2, 3), and D(4, -1). Show that ABCD is a trapezoid and determine whether it is an isosceles trapezoid.



$$\text{slope of } \overline{AB} = \frac{3 - (-1)}{-1 - (-3)} = \frac{4}{2} = 2$$

$$\text{slope of } \overline{AD} = \frac{-1 - (-1)}{4 - (-3)} = \frac{0}{7} = 0$$

$$\text{slope of } \overline{BC} = \frac{3 - 3}{2 - (-1)} = \frac{0}{3} = 0$$

$$\text{slope of } \overline{CD} = \frac{-1 - 3}{4 - 2} = \frac{-4}{2} = -2$$

$$AB = \sqrt{(-3 - (-1))^2 + (-1 - 3)^2}$$

$$= \sqrt{4 + 16} = \sqrt{20} = 2\sqrt{5}$$

$$CD = \sqrt{(2 - 4)^2 + (3 - (-1))^2}$$

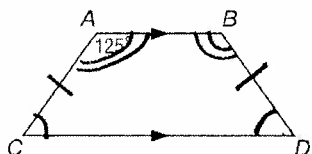
$$= \sqrt{4 + 16} = \sqrt{20} = 2\sqrt{5}$$

Exactly two sides are parallel, \overline{AD} and \overline{BC} , so ABCD is a trapezoid. $AB = CD$, so ABCD is an isosceles trapezoid.

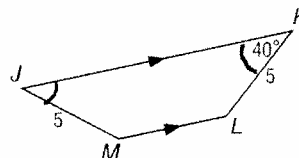
Exercises

Find each measure.

1. $m\angle D = 55^\circ$



2. $m\angle L = 140^\circ$



COORDINATE GEOMETRY For each quadrilateral with the given vertices, verify that the quadrilateral is a trapezoid and determine whether the figure is an isosceles trapezoid.

3. A(-1, 1), B(3, 2), C(1, -2), D(-2, -1)

4. J(1, 3), K(3, 1), L(3, -2), M(-2, 3)

$$28 = \frac{1}{2}(18 + x)$$

$$56 = 18 + x$$

For trapezoid HJKL, M and N are the midpoints of the legs.

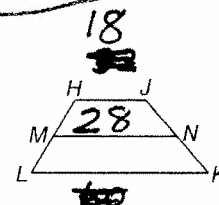
5. If $HJ = 32$ and $LK = 60$, find MN.

$$\frac{32 + 60}{2} = 46$$

6. If $HJ = 18$ and $MN = 28$, find LK.

$$2(28) - 18$$

$$37 \quad 38$$



6-6 Study Guide and Intervention (continued)**Trapezoids and Kites**

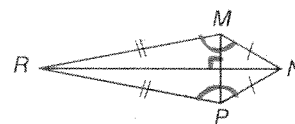
Properties of Kites A kite is a quadrilateral with exactly two pairs of consecutive congruent sides. Unlike a parallelogram, the opposite sides of a kite are not congruent or parallel.

The diagonals of a kite are perpendicular.

For kite $RMNP$, $\overline{MP} \perp \overline{RN}$

In a kite, exactly one pair of opposite angles is congruent.

For kite $RMNP$, $\angle M \cong \angle P$



Example 1 If $WXYZ$ is a kite, find $m\angle Z$.

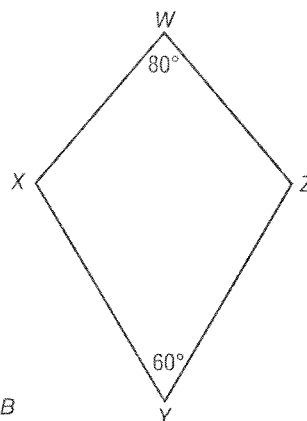
The measures of $\angle Y$ and $\angle W$ are not congruent, so $\angle X \cong \angle Z$.

$$m\angle X + m\angle Y + m\angle Z + m\angle W = 360$$

$$m\angle X + 60 + m\angle Z + 80 = 360$$

$$m\angle X + m\angle Z = 220$$

$$m\angle X = 110, m\angle Z = 110$$



Example 2 If $ABCD$ is a kite, find BC .

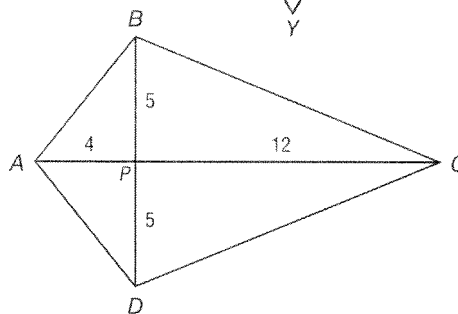
The diagonals of a kite are perpendicular. Use the Pythagorean Theorem to find the missing length.

$$BP^2 + PC^2 = BC^2$$

$$5^2 + 12^2 = BC^2$$

$$169 = BC^2$$

$$13 = BC$$

**Exercises**

If $GHJK$ is a kite, find each measure.

1. Find $m\angle JRK$.

90°

2. If $RJ = 3$ and $RK = 10$, find JK .

$$JK = \sqrt{10^2 + 3^2} = \sqrt{109} \approx 10.4$$

3. If $m\angle GHJ = 90$ and $m\angle GKJ = 110$, find $m\angle HGK$.

$$360 - 200 = 160 \div 2 = 80^\circ$$

4. If $HJ = 7$, find HG .

7

5. If $HG = 7$ and $GR = 5$, find HR .

$$HR = \sqrt{7^2 - 5^2} = \sqrt{24} = 2\sqrt{6}$$

6. If $m\angle GHJ = 52$ and $m\angle GKJ = 95$, find $m\angle HGK$.

